

You Can Be Anything – Women and Technology Video

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All things are first apprehended in the senses.

Dr. Maria Montessori

Introduction

Computer software engineering is expected to be the fastest growing occupation through 2010 and computer hardware engineers are expected to have favorable job opportunities with strong expected growth.^{1,2} And while in 2004 the short-term market may still seem slow, in fact there are plenty of new developments that translate into bona fide opportunities for technology workers.³ In the Baltimore-Washington region, there are still many technology jobs as well, including jobs with Internet companies, biotechnology research firms, and businesses supporting both the government and the military.⁴ If Maryland or any other state is going to be successful and competitive economically, educational institutions need to recruit many more students into information technology and technology-related programs.

While some science, technology, engineering, and mathematics areas have seen increasing involvement of women in the last decade, this trend is less evident in the information technology (IT) disciplines.⁵ IT outreach efforts have not prompted increased enrollments in the coursework required to pursue an IT career, most notably the mathematically rigorous computer science curriculum. In 2002, the Advanced Placement (AP) assessment for computer science recorded the lowest female participation rate of any AP discipline, with girls accounting for only 10% of the test takers for the advanced exam.⁶ “In secondary schools across the nation, a repeated pattern plays out: a further increase in boys confidence, status, and expertise in computing and a decline in the interest and confidence of girls.”⁷ The multiple applications of technology that attract girls to their use do not seem to have the same effect on their interest in developing and designing technology as it does with boys.⁸ Part of the cause may be the powerful images and stereotypes that discourage girls from considering high-technology careers. One such stereotype associates computing with socially inept male geeks wearing broken glasses and pocket protectors who stare obsessively at their computer screens for twenty hours a day and care about little else. Compounding the problem, according to the AAUW’s report *Tech-Savvy: Educating Girls in the New Computer Age*⁹, is that girls rarely “see women in the media who are actively involved in computing,” making it even more difficult for girls to imagine themselves as computer or engineering professionals. The AAUW report recommends using popular girls’ media to promote real women doing work using computer technology.

Today, approximately three-quarters of all 12 to 19 year olds spend an average of six hours per week watching music videos.¹⁰ Visual media is the primary mode of communication for most

young people today, serving as a “superpeer” that often replaces the role once played by friends and family who modeled and encouraged ways of thinking and behaving. In a matter of seconds, most young people can mimic a movie or TV character, sing an advertising jingle, or recall a familiar phrase. The 1998 Bertelsmann Foundation report found that forty years of research shows positive effects on learning from television programs that are explicitly produced and used for instructional purposes. The report goes on to state that media and technology have many advantages in terms of repeatability, transportability, and increased equity of access. The report concludes that further research should improve on what’s available.¹¹

Yet media overall have not always been positive, particularly for girls and women. A 1997 report by the Henry J. Kaiser Family Foundation identified that “across the media today, women and girls are more likely to be depicted as concerned with romance and dating as work or school, and their appearance is frequently a focus of attention.”¹² In addition, the report found that fewer women and girls than men and boys were represented in all forms of media except teen magazines. The report concluded that “the combined effect of these studies provides all concerned about America’s girls with a clear agenda: give girls an unequivocal message that they are valued for who they are, what they do, and who they want to become.” This project seeks to do just that.

Rationale

The Center for Women and Information Technology (CWIT) at the University of Maryland Baltimore County (UMBC) applied to and received funding through the National Science Foundation (HRD 0404813) to develop a video that would use the power of media to give young people, particularly girls and young women, a very positive impression of the career opportunities for women that are now available in all fields. Further, the video would focus on the importance of learning about and using all kinds of technology, no matter what the career direction, as it will play a major role in any career path in the future. The short, fast-paced, high-quality video would use the techniques of music videos to portray a wide variety of women, both past and present, working in a wide variety of fields, all using technology. The music and images would be combined in exciting ways that appeal to young people, engage their emotions, capture their attention, and convey the message that technology is cool and offers exciting fields for women as well as men.

Of course, no short video, no matter how skillfully conceived and executed, is likely by itself to persuade young women to prepare for a high-tech career. What the video would do is capture young people’s attention, offer them a presentation of women’s involvement with technology that appeals to the emotions and the senses as well as to the intellect, and make them more receptive to the speaker’s message. To test the validity of this assumption, the Center is currently assessing the perceived effectiveness of the video with a speaker compared to a presentation done by a speaker without the video.

Project Goals and Outcome Objectives

Goal: This project seeks to increase girls’ and women’s awareness of and interest in career opportunities in information technology and technology-related careers. This goal will be

achieved through the development and completion of the following four objectives.

Objective 1: *Create a four-minute, high quality video presenting diverse images of successful women in science and technology careers and targeting girls and young women ages 12 - 20.*

Objective 2: *Develop a speakers program involving female UMBC students and faculty and representatives from the business community, who will use the video as an exciting entrée to a discussion of women's opportunities in science and technology careers.*

Objective 3: *Once the video is completed, evaluate a speaker's success, with and without the video, in educating a total of 1500 middle, high school, and community college students about the opportunities for careers in IT and related science fields, with a focus on women.*

Objective 4: *Develop guidelines for integrating the video and speaker into any venue, including classrooms, after-school and summer programs, assemblies, career fairs, programs for college freshmen, and other programs for young people.*

Developing and Researching the Idea

The idea of developing a video was prompted by a ceremony in which General Motors received an award. As the winners stood to receive the award, the lights went down and a video began. The sound of ocean waves and seagulls faded in and the image of a large summer sun setting in the sky over an open beach was projected on a forward screen. The word *summer* faded in and out and *is just a state of mind* did the same. As the words faded out, the first guitar strains of Don Henley's song *The Boys of Summer* began, followed by his scratchy voice singing "I never will forget those nights..." 1950's and early 60's images appeared in antique yellow with words fading in and out on the screen. Halfway through the video, the pictures changed, becoming modern and high tech. Rich colors were added, creating vibrant, exciting images.

The video continued for only four minutes, but in that time it successfully captured the emotions of the diverse audience. Business and education leaders, support staff and hotel employees stopped their work, tapped their feet, nodded at the memories and smiled at the bright future. As the video ended, the award winner stepped to the podium and began to speak. He had the audience's full attention.

Claudia Morrell, Director of the CWIT and co-author here, was in the audience that day and immediately appreciated the value that the video played in marketing the speaker's message. She wondered whether this same format could be used for a video that would engage students through their senses and prepare them to be receptive to a speaker about women and IT.

To pursue this idea, the Center conducted a review of currently available videos about specific technology careers and women in science and technology. Those intended for young people addressed the topic in a traditional, slower-paced educational format. Though one video used students as actors, a focus group of middle and high school students felt the video was patronizing and boring. Clearly student input during the development of a video geared toward youth is critical.

With the permission of its creators, CWIT took the GM video to several secondary schools and community college classes to see whether young people would respond well to such a video. Middle, high school, and community college students viewed the video. The tables below represent the findings.

The Participating Schools

Pine Grove Middle School is located on the dividing line between an aging working class community and a developing white-collar professional community. The combination has kept the school's enrollment between 1,100 and 1,200 over the last decade. Over twelve percent of students receive free and reduced lunch. Seventeen percent of the students are minority. Pine Grove ranks second in Baltimore County in mathematics scores and 6th in reading. Nevertheless, Ms. Martz, the science teacher at Pine Grove whose class participated in the initial video evaluation, stated that despite these high numbers, she sees girls stepping back from the computers and allowing boys to handle the hardware.

Meade Middle School, located in Anne Arundel County, is part of the fifth largest school system in Maryland. Forty percent of their students receive free and reduced lunches. The school has a 61% minority population and a transient rate of 33%. Meade Middle currently has the second lowest algebra scores in the county. Doing well in mathematics is a primary predictor of success in technology careers. Lacking ability or interest in mathematics too often closes doors early on future opportunities for IT careers. Hearing about the development of this project, the principal asked that his school be included.

Parkville High School and Center for Mathematics, Science and Computer Science is a public, comprehensive high school with an approximate enrollment of 1,850 students. Parkville's diverse student body includes over 100 students from more than 20 countries in the ESOL program. Sixteen percent of Parkville students receive free or reduced lunches. In September 1994, Parkville opened a regional magnet program for mathematics, science, and computer studies. Total enrollment for this program for 1999 – 2000 was 555, with the girls' enrollment at 175. Twenty percent of the magnet program student population is minority. A wide range of academic and elective offerings, from Marketing to Advanced C++ programming, prepare students for college and work.

Boys make up 75% of the students in the three state-of-the-art computer labs, courses, and programs. Boys also dominate Parkville's First Robotics Team, an engineering-based extra-curricular activity. In 2002, when the Center first contacted the school, all forty participants, the supporting engineers representing community businesses, and the teachers were male. Additional conversations indicate that girls have recently joined the team, but their numbers are still very low. Working with Parkville provides a unique opportunity to involve a diverse population of students including both participants and non-participants in the magnet program.

The Community College of Baltimore County (CCBC), the largest community college in the state, consists of three college campuses (Essex, Dundalk, and Catonsville) and five extension centers. CCBC enrolls more than 50% of all Baltimore County residents, with full-time credit

enrollment of 6,494 and part-time enrollment at approximately 5,000. While community colleges in Maryland boast almost equal numbers of men and women in IT-related courses, on closer inspection the data reveal large numbers of women in data processing, a low skill, low-wage position. The reality is that men outnumber women in engineering transfer, computer science transfer, network administration, and engineering technology by three to one. Having access to three different campuses representing different populations and student experiences will provide important information.

Pine Grove and Meade Middle School Responses

When asked to comment on “what you think about the idea of a video highlighting women in technology,” 100% of middle school students said they thought it was a good idea. Every middle school student provided comments in the survey’s comments section explaining how much they enjoyed the four-minute video and how well they would enjoy a similar video on women in IT.

Table 1: Middle School Video Survey Results

Question/Percents	Not very Important	Not Important	Neutral	Important	Very Important
How important is the music in the video?	0%	3.12%	3.12%	46.88%	46.88%
How important is the color in the video?	0%	6.25%	15.63%	34.37%	43.75%
	Much Too Long	Too Long	Just Right	Too Short	Much Too Short
How is the length of the video?	3.12%	31.25%	34.37%	28.12%	3.12%
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Do you think a short music video would be a good lead in for a speaker?	3.12%	53.12%	34.37%	9.37%	0%
Sample size = 32 middle school students. 20 were female and 12 were male. 28 were white and 4 were non-white. The mean and median age was 13.					

Parkville High School and Center for Mathematics, Science and Computer Science Responses

Eighty-five percent of students at Parkville remarked in the comments section that they thought the idea of a similar video highlighting women in IT was a good idea. The other 15% were either critical of the idea, wrote nonsense comments, or left the comments section blank (five had no comments).

Table 2: High School Video Survey Results

Question/Percents	Not very Important	Not Important	Neutral	Important	Very Important
How important is the music in the video?	1.52%	1.52%	15.34%	27.65%	53.97%
How important is the color in the video?	0%	6.63%	18.94%	24.62%	49.81%
	Much Too Long	Too Long	Just Right	Too Short	Much Too Short
How is the length of the video?	0%	30.49	61.36	6.06	2.08
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Do you think a short music video would be a good lead in for a speaker?	25.76%	59.47%	21.59%	3.03%	3.03%
Sample size = 57 high school students. 20 were female and 37 were male; 45 were white and 12 were nonwhite. The mean and median age was 16.					

The Community College of Baltimore County

Of the community college students who critiqued the video, 100% thought a music video would be a good idea for sparking women’s interest in IT careers. Seven students failed to comment or responded inappropriately (e.g. commented that the GM video didn’t have enough women in it).

Table 3: Community College Video Survey Results

Question	Not very Important	Not Important	Neutral	Important	Very Important
How important is the music in the video?	5%	0%	20%	20%	55%
How important is the color in the video?	0%	5%	20%	30%	45%
	Much Too Long	Too Long	Just Right	Too Short	Much Too Short
How is the length of the video?	5.26%	36.84%	36.84%	21.05%	0%
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Do you think a short music video would be a good lead in for a speaker?	5%	50%	35%	10%	0%
Sample size =20 college students. 7 were female and 13 were male. 9 were white, 6 were non-white, and 5 did not report their race. The mean age was 20; the median was 19.					

Three teachers also evaluated the video, two African American women and a white man. All supported the project and encouraged the development of the video.

The students, though not as diverse as the Principal Investigator (PI) and Co-PI had desired, served nonetheless to determine overall level of interest. Future surveys, given time and resources, will be generated from a more diverse population.

In addition to the positive interest expressed by students and teachers, the Center has been contacted by several programs seeking recruiting materials to encourage girls' and young women's enrollment in science and IT camps and after-school programs.

Developing the Product

Having received positive support for the idea of developing an exciting, emotion-charged video, the Center for Women and IT assembled a committee of UMBC faculty and staff and representatives from education and businesses to discuss and develop a clear concept for a video. Together, these members represent the *Project Committee*. As part of the process, the Project Committee selected Video Press, a nonprofit associated with the University of Maryland, School of Medicine, to work as consultants on the development of the Video for the following reasons:

- A history of high quality video productions
- Multiple awards and recognition, including an Academy Award
- Small company
- 20 years of professional filmmaking experience
- Reasonable costs
- Woman on the leadership team
- Flexibility in working with Project Committee.

Together with William Whiteford and Susan Hannah Hadary, co-owners of Video Press, the Project Committee outlined the following production process for developing a four-minute video that will hold the attention of teen audiences, excite their emotions to capture their interest, and educate them about the opportunities for women in IT and related science careers. Like the GM production, this video first highlights historical footage and provides a stark contrast to today's computer engineers, astronauts, and CEOs of IT companies.

Phase I: Pre-production – 12 weeks

Phase II: Production – 12 weeks

Phase III: Post Production – 25 weeks

Phase IV: Final Evaluation – 15 weeks

Phase V: Dissemination – 15 weeks

The video entitled *You Can Be Anything* (hereafter referred to as the Video) was completed and launched on CWIT's website on January 23, 2004. In the same month, the Video also received two the prestigious international medals at the New York Festivals: a gold world medal in the category of "Best Original Music/Lyrics and a silver world medal for motivation.¹³ The Video

can be downloaded and/or viewed at www.umbc.edu/cwit or directly at www.umbc.edu/be-anything.

Identifying Classroom Support

The schools and the college listed above agreed to provide continued access to their students for input and evaluation at each phase of the video development process. One hundred and eighty-eight students (128 middle and high school, 60 community college) provided feedback through classroom focus groups and surveys. Because the diverse age range, it was critical that each age group provided input to insure their respective interests were captured. The Project Committee originally considered focusing the Video on upper level middle and high school students (ages 13 to 18), but the strong involvement and interest of community college faculty, administration, and students encouraged the Committee to expand the target audience to include freshmen enrolled in community colleges.

The Video might also be appropriate for use with freshmen at four-year institutions, but given the resources for the development of this project, initial evaluation only included community colleges.

Developing the Speakers Bureau

During the development of the Video, CWIT hired two female undergraduate students whose job was to provide input into the development of the Video, be filmed in the Video, and, once the Video was developed, serve as classroom speakers. Currently two young women are supporting this project by traveling to five middle schools, five high schools, and five community colleges with CWIT's Assistant Director and making presentations to a total of 1500 students, 100 per institution. The presentations will be made to students who have had no previous contact with the project.

The purpose of the young women's classroom visits is two-fold. First, as speakers, they educate students about issues relevant to women and IT. Second, as evaluators, they administer and collect a survey to assess student learning and identify changes in opinions and proposed actions the student might take as a result of the presentation. In half of the presentations, the undergraduate will speak without the Video; in half the Video will precede the speaker. This will allow for an evaluation of the impact of the Video (discussed below).

The educational presentation will last thirty minutes and allow an additional 15 minutes for questions. This should easily fit within the traditional 50-minute format of many colleges and some secondary school classes. Information will focus on the following ten factors.

- Historically, men were expected to assume all the leadership roles and women were expected to play a support role.
- Today women have many more options for employment than they did 100 or even 20 years ago.
- Those options include leadership roles in all fields, including IT and technology-related fields.

- Girls and women should take advanced mathematics, science, and technology courses to prepare for any career but particularly IT or a technology-related field.
- IT and engineering careers offer financial rewards, intellectual satisfaction, and social usefulness.
- Women are already doing amazing things in IT and technology-related fields.
- IT impacts every aspect of our lives.
- Educational decisions made early in life will help prepare girls for success in their daily lives and careers, but it is also never too late to think about an IT or engineering career.
- Take advantage of educational opportunities to help insure your success.
- What choices will you make?

In addition to the evaluation, CWIT will provide speakers for middle schools, high schools, and community colleges throughout Maryland. During the fall 2002 semester, UMBC welcomed its first cohort of CWIT Scholars. The CWIT Scholars Program is a merit scholarship program for talented undergraduates majoring in computer science, computer engineering, information systems, or a related program. The program is open to both women and men who support women's full involvement in information technology. In addition to completing their chosen major, CWIT Scholars participate in a series of academic and extracurricular activities designed to foster a supportive community for women in IT. Serving as a speaker at area schools will serve as part of their responsibility as CWIT Scholars.

UMBC faculty and members of the CWIT corporate advisory board have also agreed to serve as speakers once the evaluation phase has been completed to ensure long-term sustainability of the program.

Evaluation of the Project

Dr. Mark Peyrot, Director of the Center for Social and Community Research at Loyola College, serves as the external evaluator on this project. He has been instrumental in developing a cost-effective design that is helping to determine the educational value of the Video. The evaluation component includes both formative and summative evaluation of the Video Project. The *formative* evaluation gathered information from the 188 audience members for the Video then provided this information as input to guide the Video's development.

Two surveys were conducted for the word and music choice of the Video. The questionnaires were completed by 188 students from middle schools, high school, and college.

- The word choice survey for females indicated a strong preference for 'doing what I want to do' followed by 'having a job that is interesting'.
- The music survey indicated rap and rock/pop were the most popular type of music; the focus group agreed that rock/pop would be more conducive to the function and format of the Video.
- A survey was conducted for the first rough cut of the Video
- Adolescents enjoyed the Video "a lot" for the majority of categories.

Preliminary data on the presentation, effectiveness, and impact of the Video was also collected from middle school and high school teachers in Baltimore and Howard County.

- Teachers felt the Video was enjoyable and motivated them to be enthusiastic about women's career choices.
- Teachers strongly felt they would encourage their students to enter the IT field and take a computer class

The *summative* evaluation will be used to assess the effectiveness of the final Video, the speakers' presentations, and accompanying materials. As mentioned above, during Phase IV, undergraduates and CWIT's Assistant Director will travel to five middle schools, five high schools, and five community colleges and make presentations to a total of 1500 students, 100 per institution, and 750 students will participate in each treatment (using Video, not using Video) to measure its effectiveness in capturing the attention of the students prior to the speaker's message. All speakers will receive role model training.

The talk will be scripted and use hands-on technology materials to support the discussion. Examples include computer cable, a hard drive, an Ethernet card, and RAM. The speakers will be assigned randomly to each approach to eliminate the impact of unrelated elements.

Following the talk, the student audience will be allowed 15 minutes for questions. The number and content of the questions asked by students will be recorded. Students will be asked to complete a questionnaire that will include ratings of various aspects of the Video. Initially, Dr. Peyrot designed the questionnaire for the project. Input for the questionnaire was then gathered from 90 middle and high school students and 60 college students through classroom focus groups and surveys. The final questionnaire was then revised to ensure that it was measuring all the elements the group requested.

Results for each gender and race will be examined separately to determine whether the program has been effective for all students. Though females are the project's primary focus, it is essential that the Video not have negative effects on male perceptions and intentions. Initial results from the 150 students mentioned above suggest this is not the case.

In addition, ten focus groups will be established based on the following factorial design.

Education level:	Middle School High School Community College
Treatment:	Video and Speaker Speaker Only

Evaluation activities are to be completed by April 2004 and analysis shortly thereafter. While currently there is not funding to continue long term impact, the Center itself is undertaking an evaluation effort to measure the impact of this activity along with several others through the collection of enrollment trend data in four surrounding counties: Baltimore, Howard, Anne Arundel, and Montgomery. This is currently in development.

Dissemination

CWIT has been working to disseminate information about the Video and support materials through a number of different avenues, including relevant listservs, journals, partnerships with schools, conferences, radio and TV appearances, and the CWIT web site. During the evaluation phase, the Project Committee intended to send out 100 videos to Maryland schools, colleges, and programs. In fact, the Video was requested and has been received in VHS format at over 400 middle and high schools and colleges. In addition, 50 DVD copies have been requested by educators, businesses, and nonprofits throughout the world, many asking for duplication rights. We have lost track of the thousands of people connecting to the Video through the Internet because of the large number of people requesting to link to our site, including corporations like CISCO and IBM. Representatives from the Cisco Learning Academy and IBM's Excite Program are interested in using the Video as a recruiting tool for their programs which reach out to students nationally in thousands of schools. Downloading the Video is free on-line.

Information about the Video was also distributed through relevant electronic forums (listservs), in late January 2004 and is currently being seen by the educational community at conferences, such as ASEE. To support its effective use, on-line resources are provided, including the following information:

- An overview of the issues
- Data on the best use of the Video at each educational level based on the information collected from students, teachers, and the Project Committee during its development
- A presentation outline to support the Video for those unable to identify a speaker
- Additional resources on the topic
- An e-mail address for comments and questions
- Other items identified as useful for dissemination of the Video

A surprise result of the development of the Video was a request by teachers for classroom curriculum that would integrate national technology standards, and other national skill standards, to use as a tool to help develop technology literacy and encourage young people to consider technology careers. With the support of Maryland State Department of Education, Baltimore County Public Schools, and Montgomery County Public Schools, CWIT will provide the *You Can Be Anything* curriculum on its website by June 2004 for teachers throughout the U.S.

Summary and Conclusions

Students, and particularly women and minorities, haven't been given or taken the opportunity to explore more rigorous science, technology, and engineering career areas.¹⁴ Given additional attention, will students demonstrate increased enrollment in academically challenging technology programs? Is it possible to create change in enrollment without changing whole departments and programs?

The Center for Women and IT is putting this Video into the hands of educators throughout the nation. The Video by itself or even with a speaker may not permanently change attitudes or behaviors, but it will capture the interest of the viewers and encourage them to pursue further activities, such as participating in a school's First Robotics program, enrolling in a girl's science

or technology camp, seeking a mentor, or enrolling in a computer science course to see what it's all about. By exciting students' interests, others can recruit, enroll, and encourage girls and women to participate fully in IT and engineering.

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Biographical Information

CLAUDIA MORRELL is the Director of UMBC's Center for Women and Information Technology. As director, she works with federal and state governments; local, state, and national educational agencies; and businesses of all sizes to address the under representation of women in the IT workforce and technology-related fields. She served as both the executive producer and project director for the Women and IT video.

ANNE SPENCE, Mechanical Engineering faculty member, has been an engineering educator for seven years. During that time, she has developed curricula and programs to increase the participation of women in engineering, and foster an interest in engineering among middle and high school students. While at UM College Park and at UMBC, she is recognized as an outstanding engineering instructor through several awards.

TARYN BAYLES, Chemical and Biochemical Engineering faculty member and Undergraduate Coordinator, has spent half of her career working in industry and the other half teaching Chemical Engineering. She emphasizes

practical applications from her industrial experience when teaching engineering courses. She has been recognized by her students and peers with various teaching awards and offered valuable insights and support for this project.

WILLIAM SHEWBRIDGE is a producer and the manager of the UMBC's New Media Studio and a faculty member in the visual arts and education departments. He has over twenty years of experience in instructional media.